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Leaking Microwave Sensor
[Nooseol Microwave Kamchi Changchi]

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Abstract /1[*]

No details.

Representative Diagram

Figure 1

Specification

[Title of the Invention]

Leaking microwave sensor

[Brief Description of the Drawings]

Figure 1 is a block diagram of the present invention.

Figure 2 is a circuit diagram of the present invention.

Figure 3 is a detection part circuit of the present invention.

Figure 4 is a VCO oscillation circuit of the present invention.

Figure 5 is a second OP-AMP circuit part circuit of present invention.

Figure 6 is a power supply circuit.

Figure 7 is a charging indicator circuit.

Figure 8 is a status diagram showing the detection part.

* Description of key parts of the drawings *

1: detection part

2: VCO oscillation circuit

3: second OP-AMP circuit

4: power supply circuit

5: static voltage circuit

[*] Numbers in the margin indicate pagination in the foreign text.

6: charging indicator circuit

7: Gunn diode

8: damping layer

9: epoxy mold

10: Fizeau

D1, D2, D3, D4, D5, D6, D7: diode

D8: operation indicator lamp

D9: charging indicator lamp

U1A, U1B: inverted voltage amplifier

R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18: resistor

VR1, VR2, VR3, VR4, VR5: variable resistor

C1, C2, C3, C4, C5: condenser /2

Q1, Q2: transistor

[Detailed Description of the Invention]

The present invention deals with a leaking microwave sensor in which the quantity of microwave leaked from a device that employs the microwave of 2.45 GHz is measured, and an alert sound is generated in proportion to the quantity measured.

In general, microwave of the 2.45 GHz frequency is applied to the household microwave oven, equipment for semiconductor production, industrial sterilization, heating, waste processing, etc. and has the same vibration number as the water molecule so thermal energy increase of water molecules based on resonance results in heating

effects.

In case of the household microwave oven with the power of 1000 W or less, when its leaking microwave is strong, it has serious effects on a human body including cataract, bone growth suspension, and reproduction function abatement, which is known by bioexperiment etc. So each country has set up a leakage limit and used various leak prevention devices to stop leaking but no device could sense leaking microwave that results from poor performance of leak prevention devices, their failure due to long-term use, etc.

The present invention was achieved taking such aspects into account, wherein a detection part and a device part are connected by a cord, a Gunn diode used for the detection part is surrounded by a damping layer of an absorbent material, and an epoxy mold is used to provide a form so that the Gunn diode may be prevented from being damaged by strong microwave, and for the device part, its attenuated measurement signal is compensated for and amplified for operational indication, and a subsequent alarm sound is subject to frequency changing so that sensing may be achieved easily and awareness of leaking microwave enhanced. It is described in detail as follows referring to the attached drawings.

It is achieved wherein current generated at the Gunn diode D1 flows through a resistor R1 and a gain is set up at an inverted voltage amplifier U1A, and output from the inverted voltage amplifier U1A passes via a diode D4 and undergoes amplification at the VCO

oscillation circuit 2 and the inverted voltage amplifier U1B to connect the detection part 1 at which an ammeter is driven with a second OP AMP 3 that drives a Fizeau 10 and to connect a power supply circuit 4 at which a static voltage circuit 5 is added with a charging indicator circuit 6.

At the detection part for leaking microwave D1 represents the Gunn diode 7 of a pointer-contact diode type whose elements may be damaged upon exposure to strong microwave, so it must be sealed with a decorating part for damping. In addition, D1 is attached to one side end of a measurement rod that is away from a main body, sealed with the decorating part, and moved closer to a potential leaking area of a measurement target before it is used so it must be connected with the main body by a cord.

Diodes D2 and D3 are intended for overvoltage protection at the input terminal of the inverted voltage amplifier U1A, and its permissible input is limited to approximately 0.7 V or less. If an overvoltage of 0.7 V or higher is applied as input, it passes via either one of the diodes D2 and D3 and flows to a ground. Current generated at the Gunn diode D1 is manifested as a voltage at the resistor R1.

When the gain of the inverted voltage amplifier U1A is set up by a combination of resistors R2 and R3 with a variable resistor VR1, its gain range is $-(R3 + VR1)/R2$ theoretically which corresponds to 11-1011 fold and is restricted as the permissible limit of power

voltage. The resistor R4 and variable resistor VR2 adjust offset of the inverted voltage amplifier U1A, and output from the inverted voltage amplifier U1A passes via the diode D4 and drives an ammeter, and a variable resistor VR3 is used to adjust an ammeter and its sensitivity.

In addition, output from the inverted voltage amplifier U1A passes via the variable resistor VR4 for VCO sensitivity adjustment and the bias resistor R5 of VCO and then connects with the emitter in the transistor Q2 of VCO.

For the VCO oscillation circuit 2, its oscillation frequency undergoes fluctuation by a voltage and so oscillates at a high frequency in proportion to the quantity of microwave leakage to generate an alarm. While one VCO NE566 can control frequencies upon changing the voltage of VC, because the control range of frequencies is only about 1 : 6, the current flow into an RT terminal is made to be proportional to the control voltage VC so that voltage control may be achieved linearly in the oscillation frequency range of about 1 : 50. It varies from about 0 to 2400 Hz on an actual circuit depending upon the quantity of leaking.

While the resistor R6 determines the range of control voltage, if too high a value (2.2k or more) is used, the bias voltage of VCO falls below the permissible value so oscillation does not take place.

The voltage of VC must be set up by the ratio of R7 to R8, and the resistor R9 is the bias voltage of transistors Q1 and Q2. When

the value of the condenser 4 is 0.047 μF and VC is 10V, the oscillation frequency becomes approximately 6.5 KHz.

The variable resistor VR5 that is connected with the base of the transistor Q1 and Q2 is intended for local manipulation, and if a variable resistor VR5 and the variable resistor VR4 of an input terminal are manipulated such that there is no leakage, adjustment must be made to prevent oscillation. In addition, because the adjusted value must not fluctuate following power voltage fluctuation in the voltage control mode, the static voltage circuit 5 is added to the power supply circuit 4.

VCO spherical wave output passes via the coupling condenser C5 and becomes amplified at the inverted voltage amplifier U1B to drive the Fizeau 10, and the gain of the inverted voltage amplifier U1B results in approximately 15 fold based on inverted voltage amplification.

In the power supply circuit 4, two 9-V batteries are respectively supplied to OP-AMPs at each end, and the 18-V static voltage circuit 5 comprising a resistor R12, a transistor Q3, and diodes D5 and D6 has restriction on the power supply of 18 V or higher and prevents oscillation of VCO. Because the voltage of the 18 V power supply becomes disintegrated into the condensers C1 and C2 by 9 V each by way of the same resistors R13 and R4 whose resistor errors are small after it has passed via the static voltage circuit 5, two uniform power supplies (± 9 V) are available even if voltages of the two

batteries are different, and D8 represents an operation indicator lamp for a detector.

The charging indicator circuit 6 corrected with the power supply circuit 4 operates when its power supply voltage drops to 15.8 V. While the detector operates below 15.8 V, indication values of the ammeter concerning leakage quantities and alarm oscillation of VCO have large errors so batteries must be replaced.

The charging indicator lamp D9 initiates its on/off operation /3
when the voltage of two 9 V batteries at both ends falls below the permissible value of 15.8 V, and maintains its off state at 14 V or less.

SCR is driven by the voltage distributed by resistors R17 and R18, and a Zener diode D7 has an avalanche point at 15.6 V by the small current generated from the circuit.

In addition, because the Gunn diode D1 used for the detection part 1 is surrounded by a damping layer 8 of 1 mm in thickness consisting of a 2.45 GHz absorbent material and takes its form by an epoxy mold 9, the Gunn diode D1 can be prevented from being damaged by microwave when the damping layer 8 has a damping factor of approximately -20 ~ -30 dB.

The sensor has the total consumption power of 15 mA at 18 V, which may last for approximately 10 hours, and if leaking microwave has a frequency component so VCO is not used, output from the second terminal OP-AMP is connected with the first terminal OP-AMP directly

so the bias power of VCO is also disconnected.

As described above, the present invention deals with the leaking microwave sensor, wherein 2.45 GHz microwave that leaks into space up to 100 mW/cm^2 can be easily measured, and an alarm sounds in proportion to it so that microwave leaking from a microwave based device that has serious effects on a human body may be sensed easily.

(57) Claims

Claim 1.

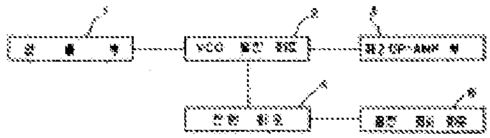
A leaking microwave sensor wherein current generated at the Gunn diode D1 flows through a resistor R1 and a gain is set up at an inverted voltage amplifier U1A, and output from the inverted voltage amplifier UIA passes via a diode D4 and undergoes amplification at the VCO oscillation circuit 2 and the inverted voltage amplifier U1B to connect the detection part 1 at which an ammeter is driven with a second OP-AMP 3 that drives a Fizeau 10 and to connect a power supply circuit 4 at which a static voltage circuit 5 is added with a charging indicator circuit 6.

Claim 2.

The leaking microwave sensor recited in Claim 1, wherein its Gunn diode is surrounded with a damping layer 8 of a 2.45 GHz absorbent material at the thickness of 1 mm and takes form D1 by an epoxy mold 9 is attached to one side end of a measurement rod that is connected with a main body by a cord.

Drawings

Figure 1



Key: 1) detection part; 2) VCO oscillation circuit; 3) second OP-AMP Part; 4) power supply circuit; 6) charging indicator circuit

Figure 2

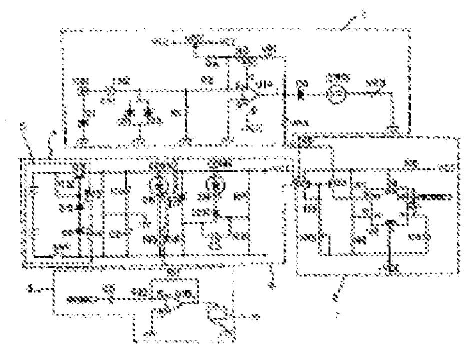
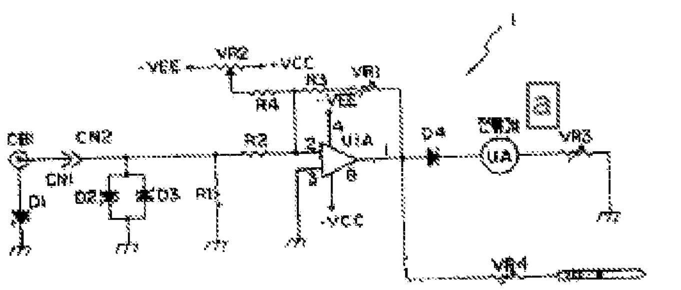


Figure 3 /4



Key: a) ammeter

Figure 4

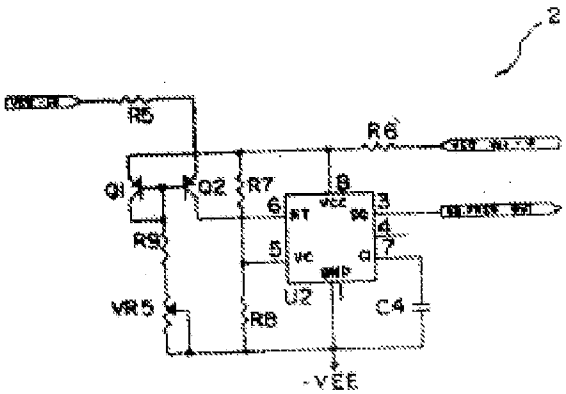


Figure 5

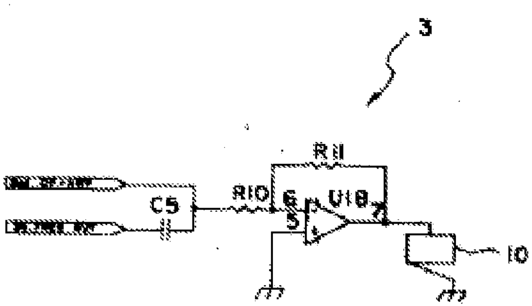


Figure 6

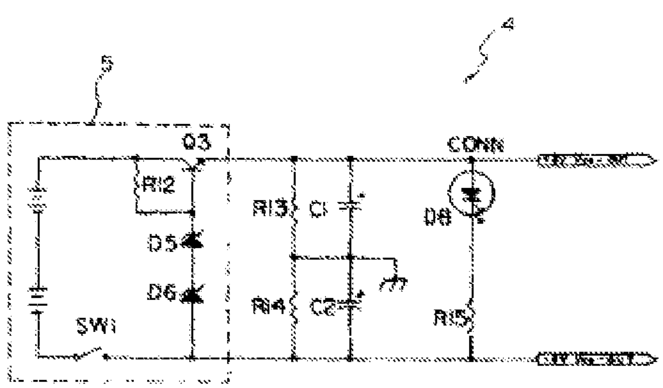


Figure 7

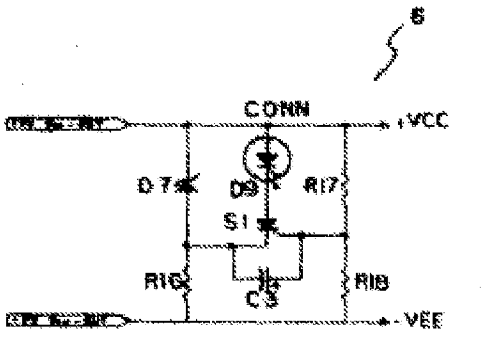


Figure 8